

Confirmation no. 9018, A. D. Barfield, Art Unit 3636; 09/554,464; Docket No: PAT6C; Go /

What is claimed:

1. A restraint system equipped with a shoulder holder to increase survival chance in a real-world accident of a vehicle, train or an aeroplane or in an inflight turbulence, comprising
5 a seat belt (1d, 1e), consisting of several belt portions, at least one latch plate, a buckle assembly, a belt pretensioner and belt fittings;
a shoulder holder (10d), having a pair of shoulder caps (10.2d), which, when in a resting position, are located in a seat backrest (3.2d, 3.2e); and
a rotatable device (28), having a pair of rotatable levers (28.5), retained by stop pieces
10 (28.9) in the resting position, where the rotatable levers (28.5), having first ends, connected to the pair of shoulder caps (10.2d), and second ends, connected to each other by a shaft (28.7), are rotatably attached to a pair of casings (29), each of which, defined by an L-shaped plate (28.4) and two outer tubes (28.1, 28.2), connected to each other by a coupling wall (28.3), is height-adjustable, latchable and guided by inner tubes
15 (71, 72) of a seat backrest frame (3.4d, 3.4e);
wherein
a passenger is restrained by the seat belt (1d, 1e) and his shoulders are restrained by the shoulder caps (10.2d), moved by the rotatable device, when operated from the resting position to an operative position;
20 where at least one shoulder belt portion of the seat belt (1d, 1e) is extended over the respective shoulder cap and a U-shaped plate (10.15) thereof, when the rotatable levers (28.5) are rotated, causing release cams (28.6) of the rotatable levers to force a rotation of lock pawls (28.8), pre-loaded by first springs (28.10), thereby permitting locking pins (28.12), pre-loaded by second springs (28.13) and loosely guided in guide tubes (28.11),
25 to move into holes (28.14) of the casings (29) and block the rotatable levers in both directions.
2. A restraint system equipped with a shoulder holder to increase survival chance in a real-world accident of a vehicle, train or an aeroplane or in an inflight turbulence, comprising
a seat belt (1, 1e), consisting of several belt portions, at least one latch plate, a buckle
30 assembly, a belt pretensioner and belt fittings;

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- a shoulder holder (10e), having a pair of shoulder caps (10.2e), which, when in a resting position, are located on an upper portion of a seat backrest (3.2d, 3.2e); and
- a motor-driven rotatable device (28a), having a drive apparatus (80) and a pair of rotatable levers (28.5a), having first ends, connected to the pair of shoulder caps (10.2e), and
- 5 second ends, connected to each other by a shaft (28.7), are rotatably attached to a pair of casings (29a), each of which, defined by an L-shaped, partly laterally closed and partly laterally open plate (28.4a) and two outer tubes (41e, 41f), connected to each other by a coupling wall (28.3), is height adjustable, latchable and guided by inner tubes (71, 72) of a seat backrest frame (3.4d, 3.4e); and
- 10 vibration-dampening energy absorbers (40e, 40f), having a number of clamping elements (42e, 42f) provided with sites of predetermined fracture (s), biased, arranged along the outer tubes (41e, 41f) and tautly, less tautly and/or loosely connected to the pair of rotatable levers via stop pieces (28.9a) by corresponding wires (47e, 47f);
- wherein
- 15 a passenger is restrained by the seat belt (1, 1e) and his shoulders are restrained by the shoulder caps (10.2e), moved by the rotatable device, driven by the drive apparatus (80), from the resting position to an operative position;
- where at least one shoulder belt portion of the seat belt (1, 1e) is extended over the respective shoulder cap and a U-shaped plate (10.15) thereof, when the rotatable levers (28.5a) are rotated by the drive apparatus (80), causing release cams (28.6a) of the
- 20 rotatable levers to force a rotation of lock pawls (28.8a), pre-loaded by first springs (28.10a), thereby permitting locking pins (28.12), pre-loaded by second springs (28.13) and loosely guided in guide tubes (28.11), to move into holes (28.14) of the casings (29a) and block the rotatable levers in one direction;
- 25 where in the real-world accident or in the inflight turbulence a forward motion of the torso and head rotates the rotatable levers in another direction through the openings of the L-shaped, partly laterally closed and partly laterally plates (28.4a), thus moving the clamping elements (42e, 42f) along the corresponding tubes (41e, 41f) resulting in a work of deformation and friction, during which vibrations are dampened and a stored
- 30 energy is released by fracture of the sites of predetermined fracture of the clamping elements in excess of respective threshold values.

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3. A restraint system equipped with a shoulder holder to increase survival chance in a real-world accident of a vehicle, train or an aeroplane or in an inflight turbulence, comprising a seat belt (1, 1b, 1e), consisting of several belt portions, at least one latch plate, a buckle assembly, a belt pretensioner and belt fittings;

- 5 a shoulder holder (10, 10b, 10f), having a pair of shoulder caps (10.2, 10.2b, 10.2f) with open apertures to receive the belt portions;
a pair of latch plates (10.1b), connected to the shoulder caps (10.2, 10.2b, 10.2f), with open apertures, in which the belt portions are loosely secured by quick-release pins (10.10), when the shoulder holder and the seat belt are fitted together, and released by
10 withdrawal thereof for removal, when the shoulder holder is withdrawn; and
at least one pair of buckle assemblies (18a / 19a to 18n / 19n), attached in a seat backrest (3.2a, 3.2c);

wherein

- a passenger is restrained by the seat belt (1, 1b, 1e) and his shoulders are restrained by the
15 shoulder caps (10.2, 10.2b, 10.2f) upon plug-in connection of the latch plates (10.1b) with the buckle assemblies (18a / 19a to 18n / 19n); and
at least one shoulder belt portion of the seat belt (1, 1b, 1e) is extended over the open aperture of the corresponding shoulder cap and loosely secured in the open aperture of the latch plate.

- 20 4. A restraint system equipped with a shoulder- and neck holder to increase survival chance in a real-world accident of a vehicle, train or an aeroplane or in an inflight turbulence, comprising
a seat belt (1a, 1c, 1e), consisting of several belt portions, at least one latch plate, a buckle assembly, a belt pretensioner and belt fittings;
25 a one-piece shoulder- and neck holder (10a, 10c), defined by a neck cap (10.4a, 10.4c) and a shoulder cap (10.2a, 10.2c) with open apertures to receive the belt portions;
a pair of latch plates (10.1b), connected to the shoulder cap (10.2a, 10.2c), with open apertures, in which the belt portions are loosely secured by quick-release pins (10.10), when the one-piece shoulder- and neck holder and the seat belt are fitted together, and
30 released by withdrawal thereof for removal, when the one-piece shoulder- and neck holder is withdrawn; and

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at least one pair of buckle assemblies (18a / 19a to 18n / 19n), attached in a seat backrest (3.2a, 3.2c);

wherein

5 a passenger is restrained by the seat belt (1a, 1c, 1e) and his shoulders and his neck are restrained by the shoulder cap (10.2a, 10.2c) and neck cap (10.4a, 10.4c) upon plug-in connection of the latch plates (10.1b) with the buckle assemblies (18a / 19a to 18n / 19n); and

at least one belt shoulder portion of the seat belt (1a, 1c, 1e) is extended over the corresponding open aperture of the shoulder cap and loosely secured in the open
10 aperture of the respective latch plate.

5. The restraint system according to claim 2, wherein the shoulder cap (10.2e), recessed about a supporting tube (3.61) of a head rest (3.6), is reinforced by a reinforcing plate (10.13).

15 6. The restraint system equipped with a shoulder- and neck holder according to claim 2, further comprising a neck holder, having a pair of neck caps (10.4, 10.4b), attached to the pair of shoulder caps (10.2e), to restrain the passenger's neck in the operative position.

7. The restraint system according to claim 6 wherein the drive apparatus (80) is activated by a separately operated switch.

20 8. The restraint system according to claim 6, wherein the drive apparatus is activated by a controller, monitoring the speed, in excess of a threshold speed.

9. The restraint system according to claim 6, wherein the drive apparatus is activated by an accelerator pedal.

10. The restraint system according to claim 6, wherein the drive apparatus is activated when a sensor senses an acceleration, which exceeds a threshold acceleration.

25 11. The restraint system according to claim 6, wherein upon a pressure on a release button (87a to 87c) of the seat the drive apparatus (80) moves the shoulder- and neck holder back from the operative position to the resting position.

12. The restraint system according to claim 6, wherein the lap buckle assembly (9.1) has a master release button (84), which is connected to switches of the drive apparatus (80) and

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electrical motors (4.2b) of the remaining buckle assemblies of the seat belt via respective deactivating cables, where the master release button (84), when depressed, disengages all the latch plates and moves the shoulder- and neck holder back from the operative position to the resting position.

5 **13.** The restraint system equipped with a shoulder- and neck holder according to claim 3, further comprising

 a neck holder, having a pair of neck caps (10.4, 10.4b), insertably attached to the pair of shoulder caps (10.2, 10.2b, 10.2f), to restrain the neck upon use, where the neck caps can be detached therefrom and removed.

10 **14.** The restraint system according to claim 13, wherein the shoulder- and neck holder (10, 10b, 10f) is provided with at least one energy absorber (10.3, 10.3a, 10.5, 10.5a, 10.5c).

15. The restraint system according to claim 14, wherein the energy absorber is fastened to the cap by an adhesive fastener and detachable therefrom by opening the fastener.

15 **16.** The restraint system according to claim 3, wherein the shoulder cap is shoulder-shaped.

17. The restraint system according to claim 14, wherein the energy absorber is shoulder-shaped.

18. The restraint system according to claim 13, wherein the neck cap is neck-shaped.

20 **19.** The restraint system according to claim 14, wherein the energy absorber is neck-shaped.

20. The restraint system according to claim 19, wherein the energy absorber (10.5a), arranged in the neck cap (10.4a), serves as a neck collar having a wide portion for the chin.

25 **21.** The restraint system according to claim 3, wherein the latch plate of the holder is provided with an energy absorber (10.9).

22. The restraint system according to claim 13, wherein the shoulder- and neck cap, provided with a flange (10.12), is adjustable in height by rotating a bolt (10.7) in a threaded hole of the flange (10.12).

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